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Competitiveness of the Indonesian Construction Industry

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Abstract: Indonesia's construction industry is important to the national economy. However, its competitiveness is considered low due to the lack of success of its development strategy and policy. A new approach known as the cluster approach is being used to make strategy and policy in order to develop a stronger, and more competitive industry. This paper discusses the layout of the Indonesian construction cluster and its competitiveness. The archival analysis research approach was used to identify the construction cluster. The analysis was based on the input-output (I/O) tables of the years 1995 and 2000, which were published by the Indonesian Central Bureau of Statistics. The results suggest that the Indonesian construction cluster consists of the industries directly involved in construction as the core, with the other related and supporting industries as the balance. The anatomy of the Indonesian construction cluster permits structural changes to happen within it. These changes depend on policies that regulate the cluster's constituents.

Keywords: Construction industry, Cluster, Economic development, Competitiveness

INTRODUCTION

The construction industry influences Indonesian economic development. It is an essential contributor to the process of development by providing the physical foundations on which development efforts and improved living standards are established (World Bank, 1984). The construction industry builds and provides infrastructure for other economic sectors, such as agriculture, energy, tourism, manufacturing, trade and others.

The construction industry's influence on other economic sectors can be measured using a spreading index and a sensitivity index based on input-output (I/O) analysis. A spreading index indicates backward linkages, which provide opportunities to create investments for other sectors due to a demand in one sector of the economy. A sensitivity index indicates forward linkages, which are the provision of inputs by one economic sector for utilisation by other sectors of the economy (Bulmer-Thomas, 1982).

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With its ability to generate growth in other economic sectors, it is especially important for the construction industry to be effectively developed. One approach that has been used in developing the construction industry is the cluster approach, a concept that was popularised by Michael Porter in "The Competitive Advantage of Nations". This approach improves the industry targeting effort by capturing economic relationships among specific industry sectors and by providing a set of tools to help define economic development strategies (Anderson, 1994). Several countries, such as Switzerland, Finland and Singapore, have implemented this approach in developing their construction industries.

The purpose of this paper is to identify the cluster of Indonesian construction and analyse its competitiveness. I/O analysis was used to identify the cluster for Indonesian construction. After the cluster was identified, a survey was conducted to assess the competitiveness of the construction industry as the core industry for an Indonesian construction cluster. The paper starts with a review of the importance of the construction industry to the Indonesian economy. It then continues with a review of construction as an economic cluster. Following these reviews, the paper describes the cluster analysis for the Indonesian construction industry. Finally, the paper discusses the competitiveness of the Indonesian construction cluster.

THE IMPORTANCE OF THE CONSTRUCTION INDUSTRY TO THE INDONESIAN ECONOMY

The construction industry influences most, if not all, of any nation's economic sectors. It builds and provides infrastructure for other economic sectors, such as agriculture, energy, tourism, manufacturing, trade and others. It is an essential contributor to the process of development by providing the physical foundations on which development efforts and improved living standards are established (World Bank, 1984).

The importance of the construction industry to the economy can be measured by its contribution to the Gross Domestic Product (GDP), its contribution to investment, and the amount of manpower employed (Hillebrandt, 1988). The World Bank (1984) suggested that construction can be an important generator of jobs in developing countries. The number of people employed in the construction industry can be high since the work conducted by the industry is relatively labour intensive.

The physical nature of the work to be done, the choice of technology, and the social and economic environment shape the structure of the construction industry (World Bank, 1984). The structure is complex because of the large range of contractors' types and professional firms involved, including main contractors and sub-contractors, one-man firms and international companies, low-technology firms and sophisticated specialist firms, builders and civil engineers and a whole range of additional professionals connected to the industry (Hillebrandt, 1988).

The Economic Indicators

In Indonesia, the construction industry has grown significantly since the early 1970s. Data from BPS shows that the construction industry's contribution to the GDP has increased from 3.9% in 1973 to just above 8% in 1997. In 1998, the contribution of the Indonesian construction industry to the GDP was only 6.85%, and it declined to just above 6% in 2002. Since 2003 the construction industry's contribution to the GDP has increased, reaching 7.5% in 2006.

The Indonesian construction industry constitutes about 60% of the gross fixed capital formation. In 1978, the construction industry employed 413,000 people, or 1.57% of the total work force. In 1997, about 4.2 million people were employed by the industry, or 4.83% of the total work force. This indicates an annual growth of 13.0% in the manpower employed by the construction industry.

A large part of construction sector output is investment goods (Hillebrandt, 1988; Raftery 1991; Wells, 1986; World Bank, 1984) in the sense that they are required to produce a flow of goods, services or amenities. Consequently, the construction industry is subject to substantial fluctuations in the demand for its product. Investment can be postponed or accelerated depending upon economic conditions and government policies. After enjoying growth of 12.8% in 1996, the construction industry grew only 6.4% in 1997 and even experienced a reduction of 39.7% in 1998 (Biro Pusat Statistik, 1998).

The I/O table of the Indonesian Bureau of Statistics (Biro Pusat Statistik, 2000) indicates that the construction industry has a 'spreading index' of 1.74 and a 'sensitivity index' of 1.28. The spreading index indicates backward linkages, which in this case are the industries from whom construction buys inputs and services. Changes in the scale of these purchases may stimulate those supplying sectors to expand or contract accordingly. The sensitivity index measures forward linkages, which in this case are the industries to whom construction sells its outputs and services. Changes in the scale of these sales may indicate an expansion or contraction of investment by those industries and hence the impact on the economy directly (Bulmer-Thomas, 1982). An index higher than 1.0 indicates a stimulus that is above average, meaning the construction industry is able to generate growth in the other sectors of the economy.

The Problems

The Indonesian construction industry has not yet been capable of providing dependable support of the national economy. The causes of this problem can be internal as well as external to the construction industry. This condition is worsening due to a lack of understanding regarding this problem.

The strategies and policies implemented for the construction industry have not been useful in solving the various problems faced by the industry, in part because they are based on the assumption that the construction industry is an independent industry. This point of view separates the internal and the external components of the construction industry, which leads to a partial view of the problems faced by the industry.

CONSTRUCTION AS AN ECONOMIC CLUSTER

Industry mapping is part of the industrial economic analysis process that aims to provide a comprehensive view of the structure of a particular industry. There are two concepts for mapping an industry: the traditional sectoral concept and the cluster concept. Each concept will lead to a different view of an industry.

Sectoral vs. Cluster

In the traditional sectoral concept, a structure-performance-conduct approach is used in mapping and analysing an industry. This approach was initially implemented in the United States in 1930. The traditional sectoral approach typically provides the following information (De Valence, 2000):

- The number of building and non-building projects and the number of general contractors and specialised contractors;
- Performance of construction by grouping the companies based on the manpower employed. The performance indicators include: operating businesses, employment, wages & salaries, turnover, total income and operating expenses, operating profit before tax, total assets, total liabilities, net worth, capital expenditure, and industry gross output.

In the traditional sectoral concept, an industry is viewed as a conglomeration of similar businesses that are grouped based on an industry classification system (Roedlandt and Den Hertog, 1999). As it is based on strict constraints of an industry or sector, the traditional sectoral concept has failed in understanding the interaction and the flow of knowledge in the production network.

The other concept that has been used for mapping an industry is the cluster concept. The cluster approach was initially identified by Alfred Marshall in his book *Principles of Economics* in 1890 (Porter, 1990) and was popularised by Michael E. Porter in his book on the competitive advantage of nations in 1990 (Anderson, 1994).

A cluster can be defined as a system of businesses and institutions in a particular field that are geographically interconnected and can compete or cooperate (Porter, 1990). It can be categorised as a production network among businesses, which are dependent on each other and are connected in a value-added supply chain. It often involves strategic alliances with universities, research institutions, knowledge-intensive business services, bridging institutions (e.g. brokers, consultants) and customers (Roedlandt and Den Hertog, 1999). Therefore, it is likely that a cluster will consist of more than one sector.

Cluster mapping is performed to identify an agglomeration of production activities within a particular geographical area. In its mapping process, a cluster can have two orientations, which are regional orientation and industrial orientation (Fesser 2001).

Roedlandt and Den Hertog (1999) have a similar concept to Fesser in that the linkages between the businesses within a cluster can be based on trade, innovation, knowledge flow, or similar knowledge base or factor conditions. Hertog further explained that the cluster concept can be implemented at different levels of economic analysis, i.e., macro, meso and micro.

Different techniques can be used to identify a cluster, such as:

- I/O analysis, which focuses on trade linkages amongst a group of industries in the supply chain.
- Graph analysis, which is based on identifying small groups of businesses and their linkages. Graph analysis identifies and illustrates industry clusters by allowing four different variables to be plotted within the same graph, making it easy to assess relative economic performance. They are often presented as "bubble charts" because this allows easy visual comparison and may be used to identify industries requiring priority policy attention for development.
- Correspondence analysis, such as factor analysis, principal component analysis, multidimensional scaling and canonical correlation. These techniques identify businesses that have similar innovation styles.
- Qualitative case study approach, which is performed by Porter (1990) in his country studies.

Competitiveness of Cluster

Once a cluster has been identified, the next step is to analyse its competitiveness. Cluster competitiveness has been used as a measure of performance. This process was used by Porter (1990) in his case studies and was also used by Vock (2001) in studying the construction cluster in Switzerland.

There are different definitions of competitiveness. In their report on measuring competitiveness in selected countries, Flanagan et al., (2005) summarised the definitions of competitiveness at the country, firm and industry levels. At the country level, competitiveness is defined as trade performance of a country in the international market that leads to an improved standard of living of its people, in terms of increasing income. The objective of the competitiveness of nations centres on human development, growth and improved quality of life. At the firm level, competitiveness is related to market performance, with high productivity being the key to success. The objective of firm competitiveness, after having secured survival, is the creation of new growth options that create value for shareholders.

Competitiveness at the industry level is defined as "the extent to which a business sector: (1) satisfies the needs of customers from the appropriate combination of the product–service characteristics such as price, quality, and innovation; (2) satisfies the needs of its constituents, for example, workers in terms of wages, safe workplace, training, and steady employment; and (3) offers attractive return on investment and the potential for growth" (Momaya and Selby (1998) cited from Flanagan, 2005).

One method that has been used to understand the competitiveness of an industry is the Diamond Framework, which was introduced by Porter (1990). This Framework indicates four interrelated determinant factors of industry competitiveness (see Figure 1). The first determinant is *factor conditions,* which covers factors related to human, physical and knowledge resources. The second determinant is *demand conditions,* which describes the size, structure and sophistication of the home market demand for the products and services of a particular industry. The third determinant is *related and supporting industries*, which reflects the presence or absence of internationally competitive related and supporting industries of a particular industry in a nation. The fourth determinant is *firm strategy, structure and rivalry*, which includes the strategies and structures of firms as well as the nature of domestic rivalry.

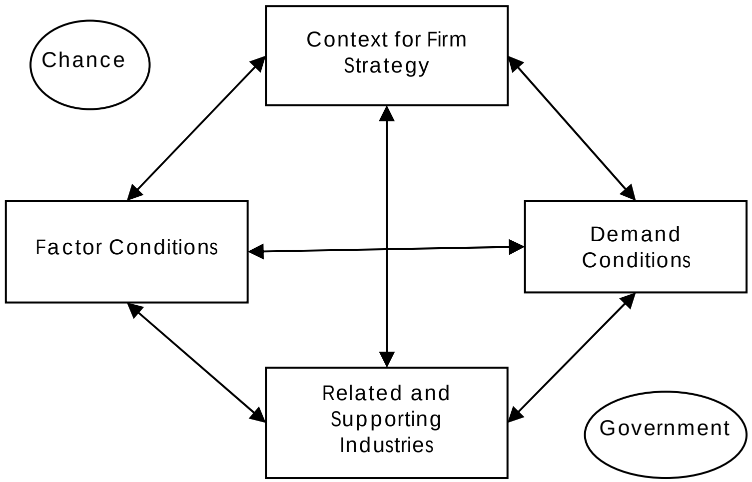

Figure 1. *The Diamond Framework* (Flanagan, 2005)

INDONESIAN CONSTRUCTION CLUSTER ANALYSIS

The identification of the Indonesian construction cluster was performed at the macro level by classifying sectors based on their linkages (Peeters et al., 2001). To identify the Indonesian construction cluster, I/O analysis was used, generating I/O tables which present statistical information in matrix format. It provides information about commodities and services transactions within the economy of a particular area or region for a specific period (Biro Pusat Statistik, 1999). In Indonesia, I/O tables are developed and published every five years by the Indonesia Bureau of Statistics (BPS).

This study used I/O tables that are based on costs derived from producer prices. The data was taken from 1995 and 2000 I/0 tables. The analysis performed resulted in two maps of the construction industry cluster.

The Analysis: M-Method

The I/O analysis was performed using the Method of Maxima (M-Method). This method has been used by the members of the Organisation for Economic Co-operation and Development (OECD) in identifying their construction industry cluster (Vock, 2001).

The M-Method uses cut-off points or threshold values to determine the inclusion of a particular sector in a specific cluster. If the required points or values are achieved, it indicates a strong linkage between a particular sector and another sector. These two sectors are then assigned into the same cluster.

The identification of the Indonesian construction cluster was performed with the following process:

1. The initial step was to screen any sectors from the overall transaction matrix that have transactions with the construction sector. Transactions include purchasing and selling. This step resulted in transaction matrices that consist of the construction sector and other sectors that conduct transactions with the construction sector.

2. The Indonesian Bureau of Statistics (BPS) divides the construction sector into five sub-sectors: residential & non-residential buildings; agricultural infrastructure; transportation infrastructure (roads, bridges and ports); energy (electricity and gas)—telecommunication—water distribution infrastructure; and other buildings.

3. The next step was to perform the two sequential analysis; the forward-linkage analysis and the backward-linkage analysis. In the M-Method, the diagonal elements of the I/O matrix are initially set to zero in order to emphasise the inter-sectoral flows (Peeters, 2001). Subsequently, the algorithm consists of two phases.

4. The final step was to develop the map of the Indonesian construction cluster. This map consists of:

   I. The construction sector;

   ii. Sectors that have direct relationships with the construction sector; and

   iii. Other sectors that have direct relationships with the sectors that have direct relationships with the construction sector. These relationships are in the form of forward-linkages and backward-linkages.

The Result: Anatomy of The Indonesian Construction Cluster

The identification of the Indonesian construction cluster has resulted in two maps, which are construction cluster maps for 1995 (see Figure 2) and 2000 (see Figure 3).

The 1995 construction cluster consists of 13 economic sectors, which include five sub-sectors of construction. The five sub-sectors of construction are the core industry of this cluster. The other economic sectors are related and supporting sectors to the construction sector.

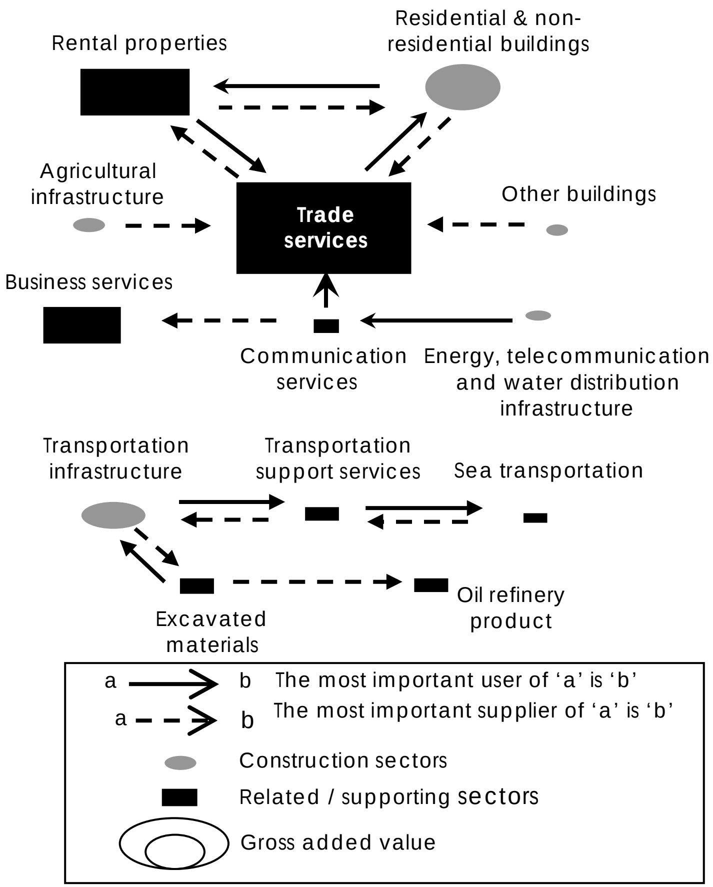

Figure 2. Indonesian Construction Cluster Map for 1995

The 1995 construction cluster can be divided into two value chains. The core industries of the first value chain consist of four construction sub-sectors: residential and non-residential buildings, agricultural infrastructure, energy (electricity and gas)–telecommunication–water distribution infrastructure, and other buildings. The related and supporting sectors include: trade services, rental properties, communication services, and business services.

Of the four construction sub-sectors, only two have forward linkages: the 'residential and non-residential buildings' sub-sector with the 'rental properties' sector; and the 'other buildings' sub-sector with the 'communication services' sector. The four construction sub-sectors have backward linkages with the 'trade services' sector. Having the largest gross valued added, the 'trade services' sector plays an important role in this first value chain.

The second value chain consists of the 'transportation infrastructure' sub-sector as the core industry with related and supporting industries that include: 'transportation support services', 'sea transportation services', 'excavated materials', and 'oil refinery products'. The 'transportation infrastructure' sub-sector has a forward linkage with the 'transportation services' sector and a backward linkage with the 'excavated materials' sector.

There is no relationship between the sectors within the first value chain and the sectors within the second value chain. However, these two value chains can be combined as the Indonesian construction cluster since they both have construction sub-sectors as the core industries.

The 2000 construction cluster consists of 18 economic sectors, which include the five construction sub-sectors. The other sectors are the related and supporting sectors as shown in Figure 3.

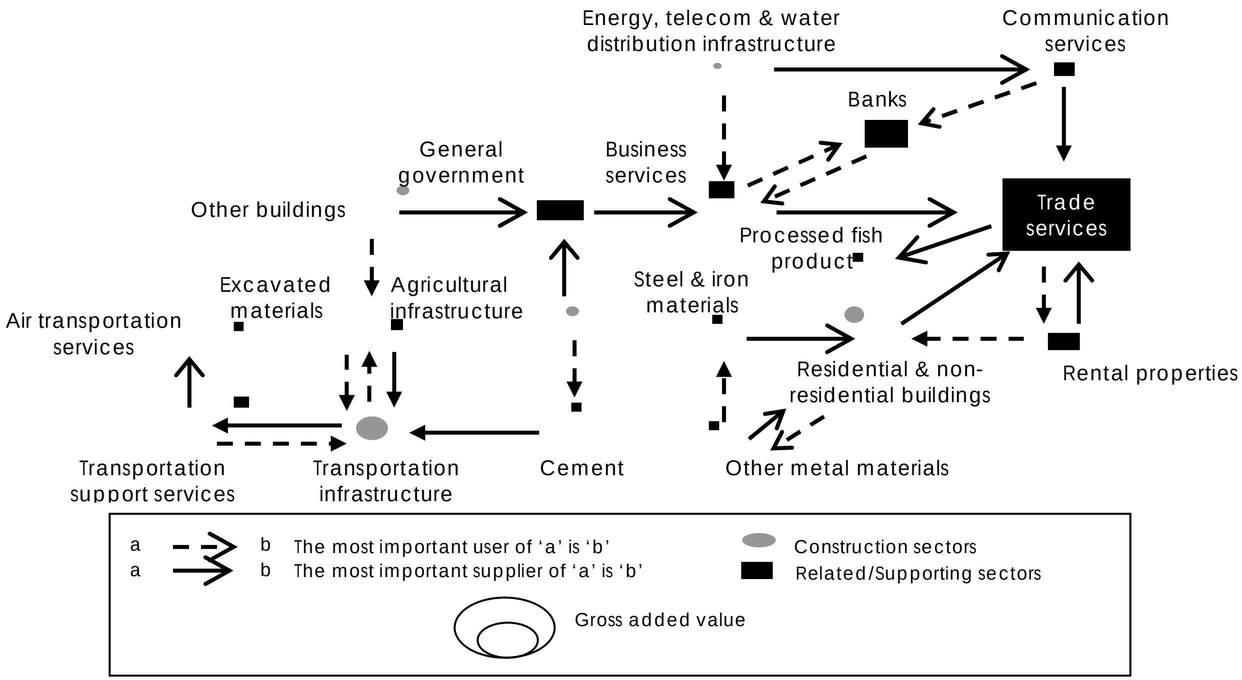

Figure 3. Indonesian Construction Cluster Map for 2000

There are forward linkages as well as backward linkages between the five construction sub-sectors and the ‘related and supporting’ sectors. The ‘residential and non-residential buildings’ sub-sector has a forward linkage with the ‘trade services’ sector. The ‘transportation infrastructure’ sub-sector has a forward linkage with the ‘transportation services’ sector. The ‘energy–telecommunication–water distribution’ sub–sector has a linkage with the ‘communication sector’. The ‘agricultural infrastructure’ and ‘residential and non-residential buildings’ sub-sectors have a forward linkage with the 'general government services' sector.

A backward linkage occurs between the ‘residential and non-residential’ sub-sectors and the ‘other metal materials’ sector. The ‘agricultural infrastructure’ sub-sector has a backward linkage with the ‘cement’ sector. The ‘energy–telecommunication–water distribution’ sub-sector has a backward linkage with the ‘business services’ sector. The 'other building' and ‘transportation’ sub-sectors have a backward linkage with the 'excavated materials' sector.

Forward linkages and backward linkages also occurred between the sectors within the related and supporting industries of the construction cluster. An example of these linkages is the forward linkage between ‘trade services’ and ‘fish processing’. This linkage indicates that the 'fish processing' sector was one of the important indirect buyers of the construction output through the 'trade services' sector.

There are some changes from the 1995–2000 construction cluster. The changes include the sectors that are involved in the cluster as well as their relationships. Table 1 summarises these changes.

Table 1 indicates that the Indonesian construction cluster is changing with time. These changes include the addition of and changes to sectors involved in the cluster as well as changes of the relationships within the cluster. These changes provide an understanding of the changing influences of the other economic sectors on the construction sector. However, the core still consists of the five construction sub-sectors because that is the way the sector is still defined.

The changes of the Indonesian construction cluster's anatomy over time indicate that this cluster has a dynamic structure. Those changes represent the changes of economic activities, which are caused by the behaviour of stakeholders involved in the construction cluster.

Table 1. Structural Changes of the Indonesian Construction Cluster

	1995 Construction Cluster	2000 Construction Cluster
Sectors involved	13 economic sectors, which include 5 construction sub-sectors and 8 other economic sectors	18 economic sectors, which include 5 construction sub-sectors and 13 other economic sectors
	The economic sectors of: bank, cement, air transportation services, general government services, other metal materials, steel and iron materials, and processed fish products are not involved in the construction cluster	The economic sectors of: bank, cement, air transportation services, general government services, other metal materials, steel and iron materials, and processed fish products are involved in the construction cluster
	The economic sectors of: sea transportation services and oil refinery products are still involved in the construction cluster	The economic sectors of: sea transportation services and oil refinery products are not involved in the construction cluster
Linkages	Of the five construction sub-sectors, all five have backward linkages, but only two have forward linkages	The five construction sub-sectors have both backward linkages and forward linkages
	The trade services sector has an important role as four of the five construction sub-sectors have backward linkages with the sector	The trade services sector is the biggest user of only the residential and non-residential buildings sub-sector
	There are two value chains	There is only one value chain

COMPETITIVENESS OF THE INDONESIAN CONSTRUCTION CLUSTER

As described previously, once a cluster has been identified, its competitiveness is then analysed. To do this, a competitiveness survey was conducted. The questionnaire survey was developed based on Porter's Diamond Framework. This section describes the survey and discusses the results.

A Competitiveness Survey

The data collected from the competitiveness survey consist of categorical variables of the ordinal type, which rank-order the responses. The survey used a Likert type of scale, where the respondents were asked to score their responses from 1 (very poor) to 5 (very good). The questions in the survey are related to the variables of cluster competitiveness.

The data collected from the competitiveness survey were analysed using statistical analysis. Two primary types of analysis were used, viz. descriptive and inferential statistics. Descriptive statistical analysis was used to measure the median of the respondents' responses. Inferential statistical analysis was used to measure associations between variables. The measure of association was used to analyse the influence, if any, of the different cluster conditions on the cluster's productivity. Since the collected data were in ordinal form, non-parametric tests were selected.

Fifty-one respondents participated in the survey. They represented engineering consultants (five respondents), construction contractors (33 respondents), design-construct contractors (10 respondents), and other construction stakeholders (three respondents). The other stakeholders included representatives of academic institutions and construction associations. The 51 respondents were members of a focus group set up by the Construction Development Services Board as part of an effort to develop a national strategy and policy for the construction industry. The survey was conducted in early 2006.

Measuring Construction Cluster Competitiveness

As described previously, the competitiveness of the Indonesian construction cluster was measured using Porter's Diamond Framework.

Demand Condition

The demand condition of the Indonesian construction cluster is represented by seven variables: construction market and its growth prospects (A1); transaction processes (A2); client's quality requirement (A3); cost (A4); services (A5); delivery (A6); and quality level of the contract relationship and its implementation (A7). Table 2 shows the respondents' assessments of these variables.

Table 2. Demand Conditions of the Indonesian Construction Cluster

Code	Variables	Median
A1	Construction market and its growth prospects	4.0
A2	Transaction processes	3.0
A3	Client's requirement on quality	4.0
A4	Client's requirement on cost	3.0
A5	Client's requirement on services	4.0
A6	Client's requirement on delivery	4.0
A7	Quality level of contract relationship and its implementation	3.0

The construction market and its growth prospects (A1) are considered good and promising. This condition is also indicated by the increasing trend of construction GDP and increasing investment in infrastructure development from both the government as well as the private sector. The clients' requirements for the quality of the construction product are high. This indicates some awareness of the importance of quality construction. The clients also have high requirements for services and delivery of the construction project. However, the requirements of cost are not considered high. The transaction processes and the quality level of the contract relationship and its implementation are still not considered good.

Factor Condition

The factor condition of the Indonesian construction cluster is represented by 17 variables: geographical condition (B1); labour productivity (B2); level of technology for product development (B3); business processes (B4); and construction plants and equipment (B5); the quality of education (B6); flow of technology from higher education institutions (B7); institutions for transfer of technology (B8); collaboration for technology development (B9); codes and standards (B10); implementation policies (B11); roles of professional associations (B12); construction associations (B13), construction services board (B14); government (B15); higher education institutions (B16); and the availability of basic infrastructure (B17). Table 3 shows the responses of the respondents to these variables.

It can be seen from Table 3 that most variables that constitute factor conditions of the Indonesian construction cluster are still considered 'not good'. This indicates that the construction cluster does not have good factor conditions that can support the production process.

Table 3. Factor Conditions of the Indonesian Construction Cluster

Code	Variables	Median
B1	Geographical condition	3.0
B2	Labour productivity	3.0
B3	Level of technology for product development	3.0
B4	Level of technology for business processes	3.0
B5	Level of technology for construction plants & equipment	3.0
B6	The quality of education	3.0
B7	Flow of technology from higher education institutions	2.0
B8	Institution for transfer of technology	3.0
B9	Collaboration for technology development	3.0
B10	Codes and standards for the construction industry	3.0
B11	Implementation policies	3.0
B12	Roles of professional associations	3.0
B13	Roles of construction associations	3.0
B14	Roles of construction services board	3.0
B15	Roles of government	3.0
B16	Roles of higher education institutions	2.0
B17	The availability of basic infrastructure	3.0

Context for Structure, Strategy, and Rivalry

The context for structure, strategy and rivalry of the Indonesian construction cluster is represented by five variables: The ratio of general to specialised contractors (C1); The level of competition among construction companies (C2); The level of trustworthiness and fairness (C3); The entry barriers in the forms of policies that prevent new entries (C4); and the ratio between direct and indirect costs (C5). Table 4 summarises the survey responses to these conditions.

Table 4. Context for Structure, Strategy, and Rivalry of the Indonesian Construction Cluster

Code	Variables	Median
C1	The ratio of general to specialised contractors	3.0
C2	The level of competition among construction companies	4.0
C3	The level of trustworthiness and fairness in the construction selection process	3.0
C4	The entry barriers in the form of policies that prevent new entries	3.0
C5	The ratio between direct and indirect costs	3.0

Most of the respondents agreed that the current ratio between general and specialised contractors is not good. The construction statistics published by the Indonesian Bureau of Statistics also indicate that there are many more general contractors than specialised contractors. The level of competition among construction companies is considered high. A lack of any barrier to entry probably contributes to the high level of competition. The level of 'trustworthiness and fairness' in contractor selection is still low, which leads to high indirect costs for construction companies.

Related and Supporting Industries

The respondents were asked to rate the following attributes of the 'related and supporting' industries: the completeness of the supporting industries (D1); the quantity of the supporting industries (D2); and the competitiveness of the supporting industries (D3). Table 5 summarises the respondents' ratings of these conditions.

Table 5. Related and Supporting Industries

Code	Variables	Median
D1	The completeness of the supporting industries	3.0
D2	The quantity of the supporting industries	3.0
D3	The competitiveness of the supporting industries	3.0

Most of the respondents stated that there is not enough variation of the supporting industries. The quantity of the supporting industries is also considered inadequate for the construction industry to perform its production processes. In addition to those conditions, the competitiveness of the supporting industries is also considered low compared to imported products.

Productivity

The respondents were also asked to assess the productivity of the Indonesian cluster based on the value added per employee compared to international construction productivity. Most of the respondents still considered productivity to be low within the Indonesian construction cluster. Using a scale of 1 (low) to 5 (high), the median response was 3.

Correlation analysis was then used to identify the variables that have the greatest influence on productivity. Table 6 shows the correlation coefficient between the competitiveness variables of the cluster and its productivity.

Table 6 indicates that productivity is correlated with 16 competitiveness variables. The construction cluster's productivity increases when clients' requirements for quality (A3) and services (A5) are higher. Improvements of labour productivity (B2), technology for product development (B3), technology for construction plants and equipment (B5), flow of technology from higher education institutions (B7), collaboration for technology development (B9), implementation policies (B11), roles of professional associations (B12), roles of construction associations (B13), roles of the construction services board (B14), and roles of higher education institutions (B16) would also lead to higher construction cluster productivity. The construction cluster's productivity is also higher when good ratios of general to specialised contractors (C1) as well as direct to indirect costs (C5) are achieved, when policies that act as entry barriers are implemented to filter new entries, and when the level of trustworthiness and fairness in the construction selection process is higher.

Table 6. Correlation between Productivity and Competitiveness Variables

Variables	F1 (Productivity)	
	Coef.	p-value
A3	0.419	0.003
A5	0.288	0.047
B2	0.283	0.049
B3	0.382	0.007
B5	0.352	0.013
B7	0.346	0.017
B9	0.296	0.039
B11	0.451	0.001
B12	0.392	0.005
B13	0.316	0.028
B14	0.424	0.002
B16	0.418	0.003
C1	0.331	0.020
C3	0.363	0.010
C4	0.404	0.010
C5	0.315	0.028

CONCLUSION

This paper has identified the cluster of Indonesian construction. The cluster consists of construction as the core industry and other economic sectors as supporting and related industries. The structure of the Indonesian construction cluster is changeable. This is due to changes in the players within the cluster, as well as changes of relationships among related players.

The competitiveness of the Indonesian construction cluster is considered low. This can be derived from the four diamonds condition as well as the productivity of this cluster. The demand conditions of the Indonesian construction cluster are considered good. However, to improve the competitiveness of the Indonesian construction cluster requires improvement in the other three diamond conditions. In addition, the productivity of the cluster should be improved. This can be done by improving the conditions of factors that are closely related to the productivity of the Indonesian construction cluster.

Further research is needed to identify and assess changes in rules and regulations that influence the firms in the cluster. In this way, the impacts of such rules and regulations on the structural changes of the Indonesian construction cluster can be identified.

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